Monopoly
Monopoly
Overview

Definition: A firm is a monopoly if it is the only supplier of a product in a market. A monopolist’s demand curve slopes down because firm demand equals industry demand.

Five cases:

1. Base Case (One price, perishable good, non-IRS Costs).
2. Natural Monopoly
3. Price Discrimination
4. Bundling
5. Durable Goods
Monopoly

Base case: Revenue

Lost Revenue = $-\Delta p \times q$

(note: $\Delta p < 0$)

Gained Revenue = $\Delta q \times p$

Revenue increases if

$\Delta q \times p > -\Delta p \times q$

Which implies:

$\frac{p \Delta q}{q \Delta p} < -1$

$\varepsilon < -1$
Monopoly
Base case: Revenue

Demand Curve Facing Monopolist (MC = 0). Decreasing price by $\Delta p$ reduces revenue on the inframarginal unit, but increases revenue on the extra marginal unit.

Which revenue effect is larger?

Revenue = $P \times Q$

Is the % decrease in $P$ greater or less than the % increase in $Q$?

It depends on the price elasticity of demand:

$$\varepsilon_d = \frac{P \ dQ}{Q \ dP}$$

Moving toward the point where $\varepsilon_d = -1$ increases total revenue.
Monopoly

Base case: Revenue

Lost Revenue = \( -\Delta p \times q \)
(note: \( \Delta p < 0 \))

Gained Revenue = \( \Delta q \times p \)

Given a price drop, revenue increases if

\[ \Delta q \times p > -\Delta p \times q \]
\[ p\Delta q > -q\Delta p \]

Which implies:

\[ \frac{(p\Delta q)}{(q\Delta p)} < -1 \]
\[ \epsilon < -1 \]
Monopoly

Base Case: Linear Demand

What does Marginal Revenue look like? Denote the inverse demand curve by \( P(Q) \). We consider simple linear demand curves here:

\[
Q = a - bP
\]

\[
P = \frac{a}{b} - \frac{1}{b}Q
\]

\[
\equiv A - BQ
\]

Total revenue is:

\[
PQ = (A - BQ)Q
\]

\[
= AQ - BQ^2
\]

Differentiate to get marginal revenue:

\[
MR = \frac{dR}{dQ} = A - 2BQ
\]
Monopoly
Base Case: Linear Demand

Marginal revenue is less than price
Monopoly

Base Case: Profit Maximization

Monopolist’s Profit Maximization Problem:

$$\max_Q \pi = P(Q)Q - C(Q)$$

(Choosing \(P\) or \(Q\) makes no difference because we are selecting a single point on the demand curve. This will not be true when we consider oligopoly problems.)

F.O.C. are:

$$\frac{d\pi}{dQ} = P(Q) + Q \frac{dP}{dQ} - \frac{dC}{dQ} = 0$$

$$\implies P(Q) + Q \frac{dP}{dQ} = \frac{dC}{dQ}$$

$$\implies MR = MC$$

\((P^*, Q^*)\) is profit-maximizing choice.
Monopoly

Base Case: Profit Maximization

Increase \( q \) if \( MR > MC \)
Decrease if \( MR < MC \)

At optimum, \( MR = MC \)
Note that Marginal Revenue may be written:

\[
MR = \frac{dR}{dQ} = \frac{d[P(Q)Q]}{dQ} = P + \frac{dP}{dQ} Q
\]

\[
P + \frac{dP}{dQ} \frac{PQ}{P} = P \left(1 + \frac{1}{\varepsilon_d}\right)
\]
Monopoly

Base Case

Inverse Elasticity Rule for Monopolist:
Price Cost Margin, Markup, or Lerner Index is:

\[ L = \frac{P - MC}{P} \]

The monopolist chooses output such that the markup equals the inverse of the elasticity of demand:

\[
\frac{P(Q) - \frac{dC(Q)}{dQ}}{P(Q)} = -Q \frac{dP(Q)}{dQ} \]
\[
= \frac{-Q dP(Q)}{P dQ} \]
\[
= \frac{1}{-\varepsilon_d} > 0
\]
Monopoly
Base Case: Welfare and Efficiency

- What is the welfare impact of monopoly?
  - Graphically
  - Algebra

- What is the reason that there is DWL?
Monopoly
Base Case: Graphically
Monopoly
Base Case: Graphically

![Monopoly Diagram](image_url)

- Consumer Surplus (Monopoly)
- Producer Surplus
- Price
- Quantity
- Demand
- Supply-MC
Monopoly
Base Case: Graphically

![Monopoly Graph](image)

- Consumer Surplus (Monopoly)
- Producer Surplus
- Transfer of Consumer Surplus to Consumer Surplus
- Lost consumer surplus
- Lost producer surplus

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<thead>
<tr>
<th>Quantity</th>
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To Reiterate: The Pricing Rule of A Monopolist Is:

\[ MR = P \left( 1 + \frac{1}{-|\varepsilon_d|} \right) = MC \]

or equivalently:

\[ \frac{P - MC}{P} = \frac{1}{-\varepsilon_d} \]

Flatter demand implies higher \( \varepsilon_d \) holding \( P \) and \( Q \) fixed, a lower monopoly markup and lower DWL.
Monopolists induce inefficient rent-seeking behavior and monopoly profit is a transfer from consumers.

But: there are benefits to monopoly: Incentives to innovate (new products, more efficient production).